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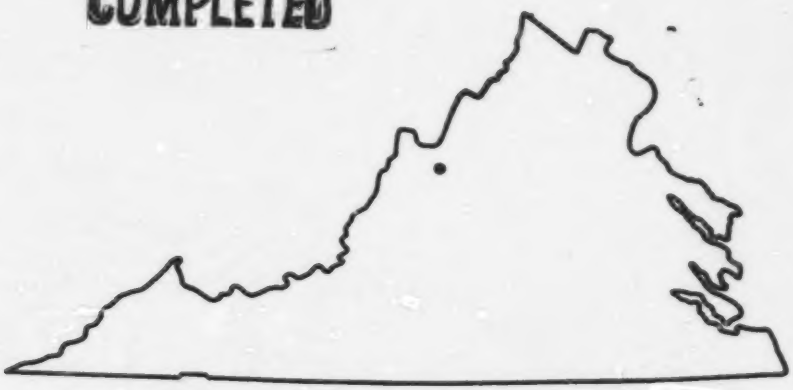
FLOOD INSURANCE STUDY

COMPLETED

CITY OF WAYNESBORO, VIRGINIA
INDEPENDENT CITY



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MAY 4, 1988

Federal Emergency Management Agency

COMMUNITY NUMBER - 515532

ORIGINAL

NOTICE TO
FLOOD INSURANCE STUDY USERS

Communities participating in the National Flood Insurance Program (NFIP) have established repositories of flood hazard data for floodplain management and flood insurance study purposes. This Flood Insurance Study (FIS) may not contain all data available within the repository. It is advisable to contact the community repository for any additional data.

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TABLE OF CONTENTS

		Page
1.0	INTRODUCTION	1
	1.1 Purpose of Study	1
	1.2 Authority and Acknowledgments	1
2.0	AREA STUDIED	1
	2.1 Scope of Study	1
	2.2 Community Description	3
	2.3 Principal Flood Problems	3
	2.4 Flood Protection Measures	4
3.0	ENGINEERING METHODS	4
	3.1 Hydrologic Analyses	4
	3.2 Hydraulic Analyses	5
4.0	FLOODPLAIN MANAGEMENT APPLICATIONS	6
	4.1 Floodplain Boundaries	6
	4.2 Floodways	7
5.0	INSURANCE APPLICATION	7
6.0	FLOOD INSURANCE RATE MAP	8
7.0	OTHER STUDIES	9

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TABLE OF CONTENTS - continued

	Page
8.0 LOCATION OF DATA	9
9.0 BIBLIOGRAPHY AND REFERENCES	9

FIGURES

Figure 1 - Vicinity Map	2

TABLES

Table 1 - Summary of Discharges	5

EXHIBITS

Exhibit 1 - Flood Profiles		
South River	Panels 01P-02P	12-13
Pratt's Run	Panel 03P	14
Jones Hollow	Panel 04P	15
Exhibit 2 - Flood Insurance Rate Map and Street Index		
Exhibit 3 - Elevation Reference Marks		

FLOOD INSURANCE STUDY
CITY OF WAYNESBORO, INDEPENDENT CITY, VIRGINIA

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study revises and updates a previous Flood Insurance Study/Flood Insurance Rate Map for the City of Waynesboro, Independent City, Virginia. This information will be used by the City of Waynesboro to update existing floodplain regulations as part of the Regular Phase of the National Flood Insurance Program (NFIP). The information will also be used by local and regional planners to further promote sound land use and floodplain development.

In some states or communities, floodplain management criteria or regulations may exist that are more restrictive or comprehensive than the minimum Federal requirements. In such cases, the more restrictive criteria take precedence and the state (or other jurisdictional agency) will be able to explain them.

1.2 Authority and Acknowledgments

The sources of authority for this Flood Insurance Study are the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

The hydrologic and hydraulic analyses in this study represent a revision of the original analyses prepared by the Soil Conservation Service (SCS) under Inter-Agency Agreement No. IAA-H-9-71, for the Federal Emergency Management Agency (FEMA). The work for the original analyses was completed in April 1971.

In this revised study, the hydrologic and hydraulic analyses were obtained from a Flood Hazard Analyses report on the South River, prepared by the SCS. Annexations of land made by the City of Waynesboro are also reflected in this revision. The work for this revised study was completed in December 1986.

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the incorporated area of the City of Waynesboro, Independent City, Virginia. The area of study is shown on the Vicinity Map (Figure 1).

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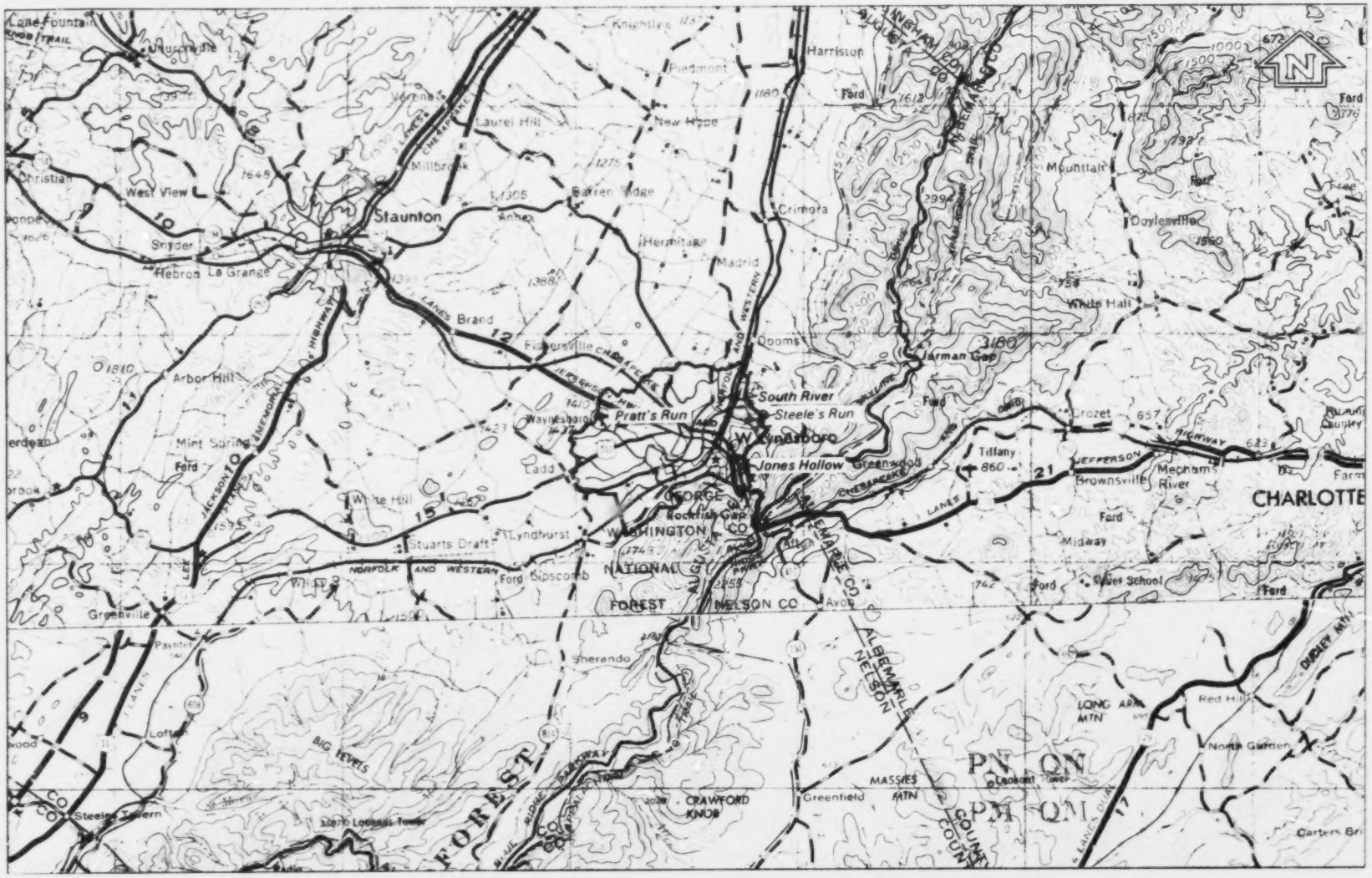

FIGURE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF WAYNESBORO, VA

(INDEPENDENT CITY)

APPROXIMATE SCALE

4 0 4 8 12 MILES

VICINITY MAP

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The following streams were studied by detailed methods: the South River, for its entire length within the community; Pratt's Run, for its entire length within the community; Jones Hollow, from its confluence with the South River to approximately 7,800 feet upstream; and Steele's Run, for its entire length within the community. The South River, Pratt's Run, and Jones Hollow were revised to incorporate annexations and updated hydrologic and hydraulic analyses. The areas studied by detailed methods were selected with priority given to all known flood hazard areas and areas of projected development and proposed construction.

Flooding on Coiner Spring Branch was found to be controlled completely by flooding from the South River and Pratt's Run, and no approximate flood boundaries were mapped. Rockfish Run and a small portion of Jones Hollow was studied by approximate methods. Approximate analyses were used to study those areas having a low development potential or minimal flood hazards. The scope and methods of study were proposed to, and agreed upon by, FEMA and the City of Waynesboro.

2.2 Community Description

The City of Waynesboro is located within the boundaries of Augusta County in northwest Virginia. It is completely surrounded by the unincorporated areas of Augusta County. In 1980, the city had a population of 15,329 (Reference 1).

The South River has a drainage area of approximately 140 square miles above the city and is the main stream flowing through Waynesboro. Pratt's Run confluences with the South River within the corporate limits; Jones Hollow also confluences with the South River and has a drainage area of approximately 5 square miles.

The average annual precipitation in the area is 38 inches, with 69 percent normally occurring during the months from April through September.

2.3 Principal Flood Problems

Minor flooding usually occurs during the early spring and summer months from thunderstorms; however, tropical hurricane activity has caused major flooding in the area. Floodwaters rose to depths of approximately 4 feet in business establishments on Main Street in 1969 and 1972 from Tropical Storms Camille and Agnes, respectively. These storms flooded approximately 6,000 acres of primarily agricultural floodplains above and below Waynesboro, which is located near the middle of the watershed.

2.4 Flood Protection Measures

Twelve floodwater retarding structures have been installed above Waynesboro under the authority of Public Law 534 administered by the SCS.

3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude which are expected to be equaled or exceeded once on the average during any 10-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for floodplain management and for flood insurance rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10, 2, 1, and 0.2 percent chance, respectively, of being equaled or exceeded during any year. Although the recurrence interval represents the long term average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood which equals or exceeds the 100-year flood (1 percent chance of annual exceedence) in any 50-year period is approximately 40 percent (4 in 10), and, for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported herein reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak discharge-frequency relationships for each flooding source studied in detail affecting the community.

Frequency-discharge curves for the streams studied by detailed methods were determined using the 1928 to 1952 records of a discontinued stream gage. Three storms were routed with input factors estimated for the 1928 to 1952 period. The frequency of each storm was determined on the curve established from the gage records. The same three storms were routed a second time through the 12 existing floodwater retarding structures with other factors adjusted to reflect current conditions in the watershed.

Stream and valley cross sections were surveyed across the South River, Jones Hollow, and Steele's Run. In order to determine stage-discharge relationships, flow factors and coefficients were estimated for each cross section. Water-surface profiles generated for various discharges and elevation-discharge curves were plotted and adjusted to known flood marks and gage discharges. Computer processing provided discharges for floods of varying magnitudes, and

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frequencies of the routed floods were established by correlation with stream gage records. Adjustment of values and coefficients and reprocessing provided data to show the effects of changed land use and added installations such as floodwater retarding structures. Additional field surveys and similar analyses were made on Pratt's Run.

A summary of the drainage area-peak discharge relationships for the South River and Jones Hollow is shown in Table 1, "Summary of Discharges." Only the 100-year discharges were used for the analyses in this study. No discharges are shown for Pratt's Run and Steele's Run because data were not available.

TABLE 1 - SUMMARY OF DISCHARGES

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-YEAR	50-YEAR	100-YEAR	500-YEAR
SOUTH RIVER					
Approximately 0.24 mile upstream of corporate limits	148.32	8,600	*	19,080	28,600
Approximately 0.51 mile upstream of confluence with Steele's Run	143.36	8,290	*	18,590	28,050
At confluence with Jones Hollow	141.30	8,200	*	18,390	27,500
Approximately 1.29 miles downstream of confluence with Pratt's Run	134.33	7,850	*	17,690	26,900
JONES HOLLOW					
Approximately 0.53 mile upstream of confluence with South River	5.15	850	*	2,300	3,800

*Data not available

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of flooding from the sources studied were carried out to provide estimates of the elevations of floods of the selected recurrence intervals.

Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles (Exhibit 1) and the Flood Insurance Rate Map (Exhibit 2) where applicable. There are no profiles

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prepared for Steele's Run in this study because none were prepared in the original study.

Water-surface elevations of floods of the selected recurrence intervals were computed using the SCS Technical Release No. 20 (Reference 2). Flood profiles were drawn showing computed water-surface elevations for floods of the selected recurrence intervals.

The hydraulic analyses for this study were based on unobstructed flow. The flood elevations shown on the profiles are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

All elevations are referenced to the National Geodetic Vertical Datum of 1929 (NGVD). Elevation reference marks used in this study are shown on the maps; the descriptions of the marks are presented in Elevation Reference Marks (Exhibit 3).

4.0 FLOODPLAIN MANAGEMENT APPLICATIONS

The NFIP encourages State and local governments to adopt sound floodplain management programs. Therefore, each Flood Insurance Study provides 100-year flood elevations and delineations of the 100- and 500-yea. floodplain boundaries and 100-year floodway to assist communities in developing floodplain management measures.

4.1 Floodplain Boundaries

To provide a national standard without regional discrimination, the 1 percent annual chance (100-year) flood has been adopted by FEMA as the base flood for floodplain management purposes. The 0.2 percent annual chance (500-year) flood is employed to indicate additional areas of flood risk in the community. For the streams studied in detail, the 100- and 500-year floodplain boundaries have been delineated using the flood elevations determined at each cross section where applicable. Between cross sections, the boundaries for the South River, Pratt's Run, and Jones Hollow were interpolated using topographic maps at a scale of 1:24,000 with contour intervals of 20 and 10 feet and aerial photographs (References 3 and 4). Flood boundaries for Steele's Run were taken from the previous Flood Insurance Study for the City of Waynesboro (Reference 5).

For Jones Hollow, which was studied by approximate methods, the 100-year flood boundary was delineated using aerial photographs (Reference 4). For Rockfish Run, which was also studied by approximate methods, the 100-year flood boundary was delineated using topographic maps (Reference 6).

The 100- and 500-year floodplain boundaries are shown on the Flood Insurance Rate Map (Exhibit 2). On this map, the 100-year

floodplain boundary corresponds to the boundary of the areas of special flood hazards (Zones A and AE), and the 500-year floodplain boundary corresponds to the boundary of areas of moderate flood hazards. In cases where the 100- and 500-year floodplain boundaries are close together, only the 100-year floodplain boundary has been shown. Small areas within the floodplain boundaries may lie above the flood elevations but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data.

For the streams studied by approximate methods, only the 100-year floodplain boundary is shown on the Flood Insurance Rate Map (Exhibit 2).

4.2 Floodways

The floodway is the channel of a stream, plus any adjacent floodplain areas, that must be kept free of encroachment so that the 100-year flood can be carried without substantial increases in flood heights.

Floodways are not available for the existing or revised study.

5.0 INSURANCE APPLICATION

For flood insurance rating purposes, flood insurance zone designations are assigned to a community based on the results of the engineering analyses. These zones are as follows:

Zone A

Zone A is the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the Flood Insurance Study by approximate methods. Because detailed hydraulic analyses are not performed for such areas, no base flood elevations or depths are shown within this zone.

Zone AE

Zone AE is the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the Flood Insurance Study by detailed methods. In most instances, whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone AH

Zone AH is the flood insurance rate zone that corresponds to the areas of 100-year shallow flooding (usually areas of ponding) where average depths are between 1 and 3 feet. Whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone AO

Zone AO is the flood insurance rate zone that corresponds to the areas of 100-year shallow flooding (usually sheet flow on sloping terrain) where average depths are between 1 and 3 feet. Average whole-foot depths derived from the detailed hydraulic analyses are shown within this zone.

Zone A99

Zone A99 is the flood insurance rate zone that corresponds to areas of the 100-year floodplain that will be protected by a Federal flood protection system where construction has reached specified statutory milestones. No base flood elevations or depths are shown within this zone.

Zone V

Zone V is the flood insurance rate zone that corresponds to the 100-year coastal floodplains that have additional hazards associated with storm waves. Because approximate hydraulic analyses are performed for such areas, no base flood elevations are shown within this zone.

Zone VE

Zone VE is the flood insurance rate zone that corresponds to the 100-year coastal floodplains that have additional hazards associated with storm waves. Whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone X

Zone X is the flood insurance rate zone that corresponds to areas outside the 500-year floodplain, areas within the 500-year floodplain, and to areas of 100-year flooding where average depths are less than 1 foot, areas of 100-year flooding where the contributing drainage area is less than 1 square mile, and areas protected from the 100-year flood by levees. No base flood elevations or depths are shown within this zone.

Zone D

Zone D is the flood insurance rate zone that corresponds to unstudied areas where flood hazards are undetermined, but possible.

6.0 FLOOD INSURANCE RATE MAP

The Flood Insurance Rate Map is designed for flood insurance and floodplain management applications.

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For flood insurance applications, the map designates flood insurance rate zones as described in Section 5.0 and, in the 100-year floodplains that were studied by detailed methods, shows selected whole-foot base flood elevations or average depths. Insurance agents use the zones and base flood elevations in conjunction with information on structures and their contents to assign premium rates for flood insurance policies.

For floodplain management applications, the map shows by tints, screens, and symbols, the 100- and 500-year floodplains. Floodways and the locations of selected cross sections used in the hydraulic analyses and floodway computations are shown where applicable.

7.0 OTHER STUDIES

A Flood Insurance Study for the unincorporated areas of Augusta County is currently being prepared (Reference 7). The results of that study will be in agreement with the results of this study.

Due to its more up-to-date analyses, this study supersedes the previous Flood Insurance Study for the City of Waynesboro (Reference 5).

8.0 LOCATION OF DATA

Information concerning the pertinent data used in preparation of this study can be obtained by contacting FEMA, the Natural and Technological Hazards Division, Liberty Square Building (Second Floor), 105 South Seventh Street, Philadelphia, Pennsylvania 19106.

9.0 BIBLIOGRAPHY AND REFERENCES

1. U. S. Department of Commerce, Bureau of the Census, 1980 Census of Population, Number of Inhabitants, Virginia, Washington, D. C., U. S. Government Printing Office, 1981.

2. U. S. Department of Agriculture, Soil Conservation Service, Technical Release No. 20, Computer Program, Project Formulation, Hydrology, Washington, D. C., 1965.

3. U. S. Department of the Interior, Geological Survey, 7.5-Minute Series Topographic Maps, Scale 1:24,000, Contour Interval 20 and 40 Feet: Waynesboro West, Virginia, 1973; Waynesboro East, Virginia, 1973.

4. U. S. Department of Agriculture, Soil Conservation Service, USDA-ASCS, Aerial Photographs, Semi-Controlled Mosaic, Washington, D. C., flown in October and November 1966.

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5. U. S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Insurance Study, City of Waynesboro, Independent City, Virginia, Washington, D. C., December 5, 1975.

6. Alster & Associates, Inc., of Washington, D. C., Topographic Maps, Scale 1:1,200, Contour Interval 5 Feet: Waynesboro, Virginia, 1965.

7. Federal Emergency Management Agency, Flood Insurance Study, Unincorporated areas of Augusta County, Virginia (Unpublished).

U. S. Department of Agriculture, Soil Conservation Service, Flood Hazard Analyses, South River, Augusta County and Waynesboro, Virginia, Richmond, Virginia, April 1974.

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EXHIBIT 3 - ELEVATION REFERENCE MARKS

Reference Mark	Elevation (Feet NGVD)	Description of Location
RM 1	1,350.67	SCS disk in base of power pole No. P-146-12, approximately 40 feet east of Bookerdale Road and approximately 320 feet south of Bookerdale Road bridge over Pratt's Run, on west side of entrance to old farm dwelling, approximately 200 feet south of apartment house.
RM 2	1,294.68	Bronze cap located in hole under round cast iron cover in centerline of junction of Wayne Avenue and Arch Avenue, approximately 1,200 feet downstream from dam at old foundry, and approximately 60 feet northeast of concrete bridge over the South River, on north riverbank.

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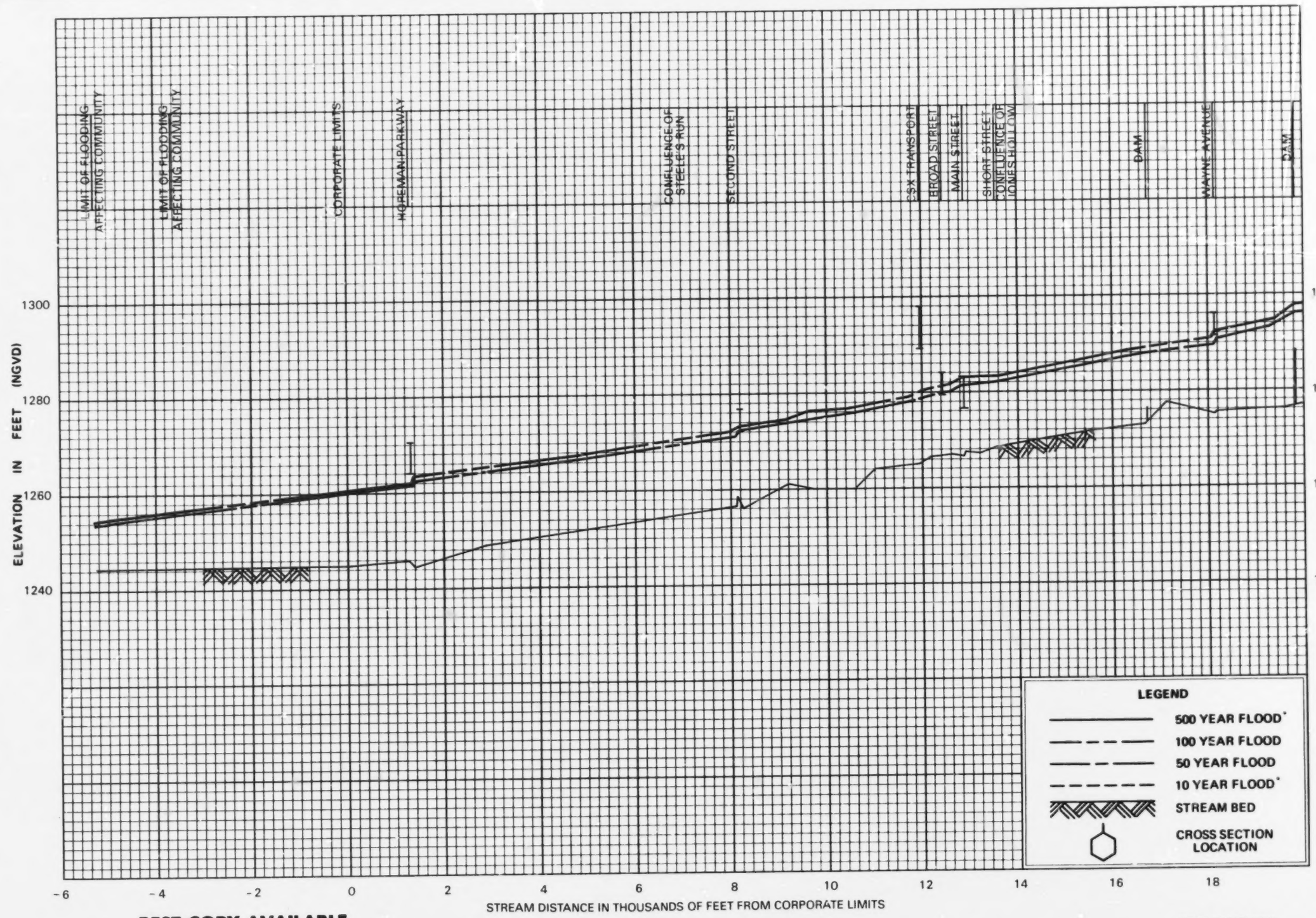

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FLOOD PROFILES

SOUTH RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF WAYNESBORO, VA
(INDEPENDENT CITY)

01P

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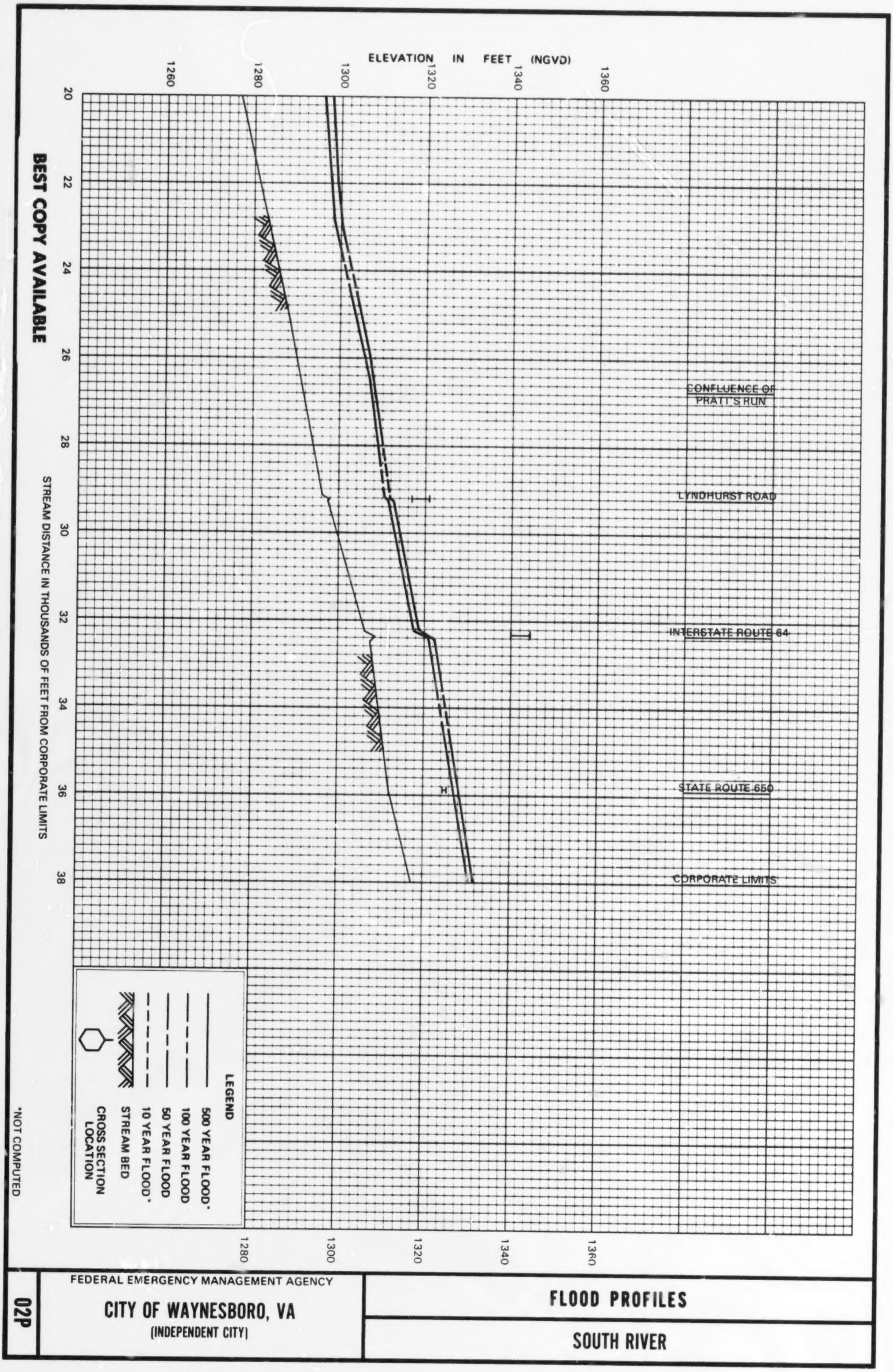

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FEDERAL EMERGENCY MANAGEMENT AGENCY

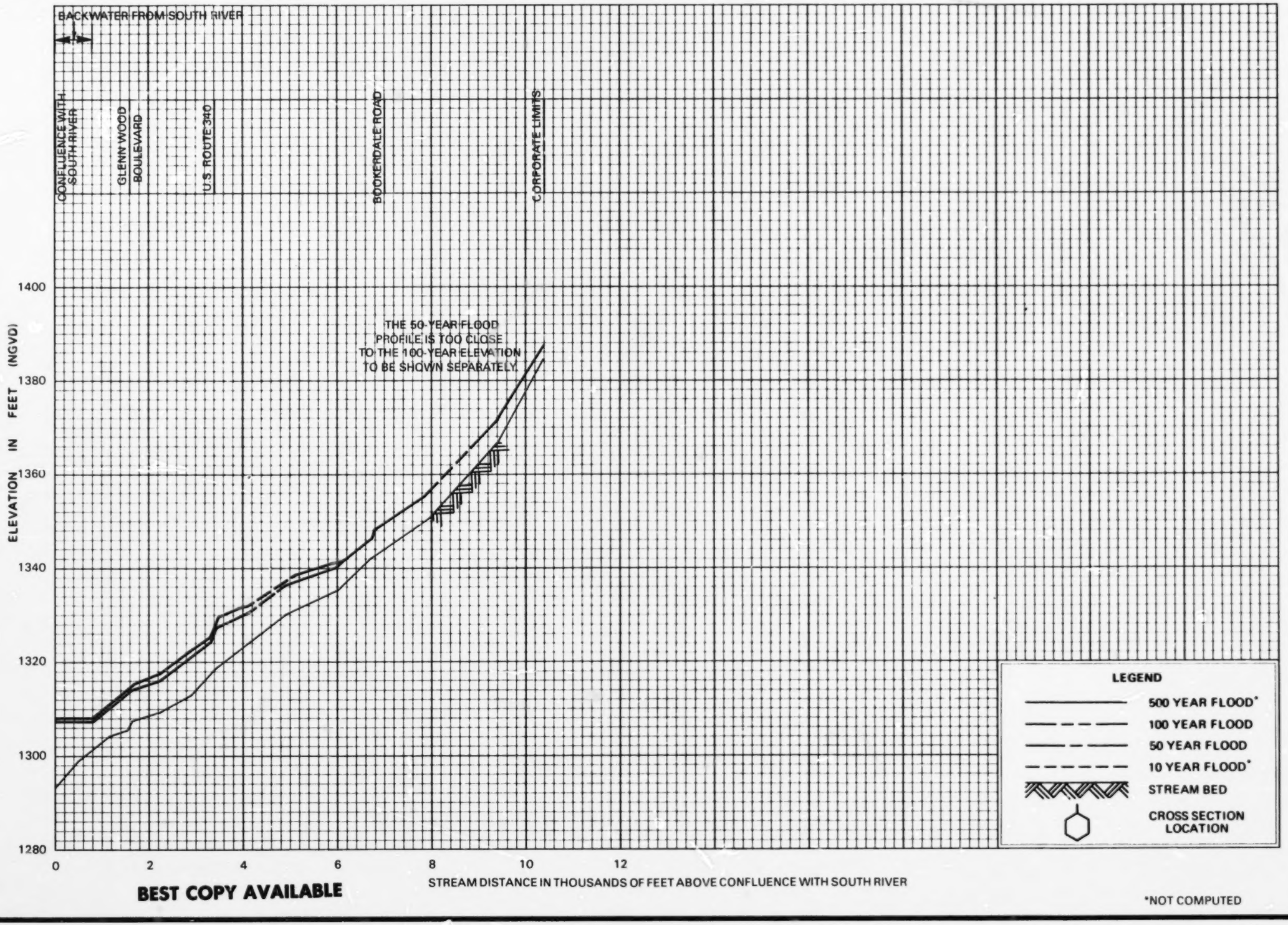
CITY OF WAYNESBORO, VA
(INDEPENDENT CITY)

02P

FLOOD PROFILES

SOUTH RIVER

13



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FLOOD PROFILES

PRATT'S RUN

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF WAYNESBORO, VA
(INDEPENDENT CITY)

03P

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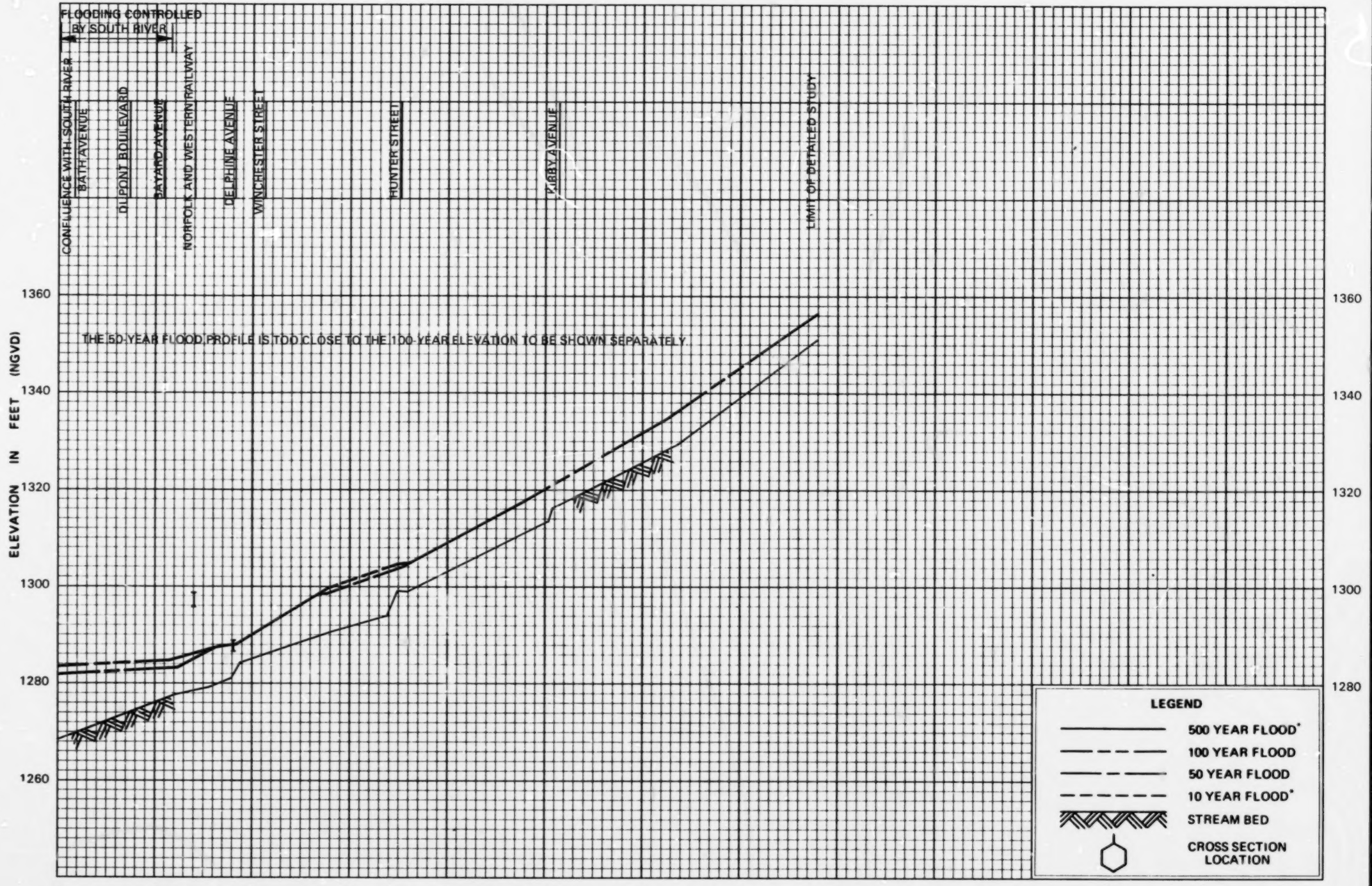

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FLOOD PROFILES

JONES HOLLOW

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF WAYNESBORO, VA
(INDEPENDENT CITY)

04P

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